

WHAT IS CLAIMED IS:

1. An acoustic model creating method for performing speech recognition within a space having noise, the method comprising:

collecting various types of noise collectable within the space having noise;

creating plural types of noise data by classifying the noise collected;

creating plural types of noise-superposed speech data by superposing the plural types of noise data on standard speech data;

creating plural types of noise-removed speech data by performing a noise removal process on the plural types of noise-superposed speech data; and

creating plural types of acoustic models using the plural types of noise-removed speech data.

2. The acoustic model creating method according to Claim 1, the noise removal process performed on the plural types of noise-superposed speech data being carried out using a noise removal method suitable for each of the noise data.

3. An acoustic model creating method according to Claim 1, the space having noise being a vehicle.

4. An acoustic model creating method according to Claim 3, various types of noise collectable within the vehicle being plural types of noise due to effects of at least one of weather conditions, a traveling state of the vehicle, a traveling location of the vehicle, and an operational states of apparatuses mounted in the vehicle.

5. An acoustic model creating method according to Claim 1,

collecting noise comprising a recording step of recording individual noise parameters corresponding to the plural types of noise to be collected, and

the plural types of noise to be collected being classified using each noise parameter corresponding to the plural types of noise to be collected, thereby creating the plural types of noise data.

6. A speech recognition apparatus for performing speech recognition within a space having noise, the apparatus comprising:

a sound input device that inputs speech to be recognized and other noise;

plural types of acoustic models created by an acoustic model creating method, the acoustic model creating method comprising: collecting various types of noise collectable within the space having noise; creating plural types of noise data by classifying the collected noise; creating plural types of noise-superposed speech data by superposing the created plural types of noise data on previously prepared standard speech data; creating plural types of

noise-removed speech data by performing a noise removal process on the created plural types of noise-superposed speech data; and creating plural types of acoustic models using the created plural types of noise-removed speech data;

a noise data determination device that determines which noise data of the plural types of noise data corresponds to the noise inputted from the sound input device;

a noise removal processing device that performs noise removal on the noise-superposed speech data on which the noise inputted from the sound input device are superposed based on the result of the determination of the noise data determination device; and

a speech recognition device that performs speech recognition on the noise-removed speech data, from which noise is removed by the noise removal processing device, using one of the plural types of acoustic models corresponding to the noise data determined by the noise data determination device.

7. The speech recognition apparatus according to Claim 6, the speech recognition apparatus further comprising a noise parameter acquisition device that acquires noise parameters corresponding to the noise inputted from the sound input device.

8. The speech recognition apparatus according to Claim 6, the noise removal process on the plural types of noise data obtained by the classification being performed using a noise removal method suitable for each of the noise data.

9. The speech recognition apparatus according to Claim 6, the space having noise being a vehicle.

10. The speech recognition apparatus according to Claim 9, various types of noise collectable within the vehicle being plural types of noise due to the effects of at least one of weather conditions, a traveling state of the vehicle, a traveling location of the vehicle, and an operational states of apparatuses mounted in the vehicle.

11. The speech recognition apparatus according to Claim 6, collecting noise comprising recording individual noise parameters corresponding to the plural types of noise to be collected, and

the plural types of noise to be collected being classified using each noise parameter corresponding to the plural types of noise to be collected, thereby creating the plural types of noise data.

12. The speech recognition apparatus according to Claim 6, the noise removal process at the time of creating the plural types of acoustic models and the noise removal

process at the time of performing speech recognition on the speech to be recognized being performed using the same noise removal method.

13. A speech recognition apparatus for performing speech recognition within a space having noise using plural types of acoustic models created by an acoustic model creating method according to Claim 1, the apparatus comprising:

- a sound input device that inputs speech to be recognized and other noise;
- a noise data determination device that determines which noise data of previously classified plural types of noise data corresponds to the current noise inputted from the sound input device;

- a noise removal processing device that performs noise removal on noise-superposed speech data on which the noise inputted from the sound input device are superposed based on the result of the determination of the noise data determination device; and

- a speech recognition device that performs speech recognition on noise-removed speech data, from which noise is removed by the noise removal processing device, using one of the plural types of acoustic models corresponding to the noise type determined by the noise data determination device.

14. A vehicle having a speech recognition apparatus which is able to be operated by speech, the speech recognition apparatus being the speech recognition apparatus according to Claim 6.